

WHAT IS CLAIMED IS:

1. An optical scanning apparatus, comprising:
light source means;
an incident optical system for temporarily
5 focusing a beam emitted from the light source means
in a sub-scanning section to form a linear image on a
deflection surface of a light deflector; and
a scanning optical system for guiding the beam
deflected by the light deflector onto a surface to be
10 scanned, wherein:
the beam from the incident optical system is
incident at an angle with a normal to the deflection
surface in the sub-scanning section;
the scanning optical system has a scanning
15 optical element having a refractive power in the sub-
scanning section; and
an optical axis of the scanning optical element
is eccentric toward a deflection point side of the
deflection surface with respect to a transmission
20 position of a principle ray of the beam in a sub
scanning direction to meet the following expression:

$$(\beta_{\max} - \beta_{\min}) < P/\Delta L$$

- 25 where β_{\max} represents a maximum value of an imaging
magnification in the sub-scanning section of an
entire scanning region of the scanning optical system

and β_{\min} represents a minimum value of the imaging magnification in the sub-scanning section of the entire scanning region of the scanning optical system; P represents a pixel size defined according to a resolution in the sub-scanning section; and ΔL represents a distance between the normal to the deflection surface at the deflection point and the optical axis of the scanning optical element in the sub scanning direction.

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2. An optical scanning apparatus according to claim 1, wherein the imaging magnification in the sub-scanning section of the scanning optical system is set to $\pm 10\%$ or less in the entire scanning region.

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3. An optical scanning apparatus according to claim 1, wherein the imaging magnification in the sub-scanning section of the scanning optical system is 0.7-fold or higher magnification in the entire scanning region and the scanning optical system includes a first scanning optical element having a refractive power in a main-scanning section and a second scanning optical element having a refractive power in the sub-scanning section, which weakens from an on-axis position to an off-axis position.

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4. An optical scanning apparatus according to

claim 3, wherein in the sub-scanning section, the principle ray of the beam incident on the second scanning optical element enters the second scanning optical element at an angle with an optical axis thereof and the optical axis of the second scanning optical element extends in parallel to the normal to the deflection surface.

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10 5. A color image forming apparatus comprising an image bearing member arranged on a surface to be scanned of the optical scanning apparatus according to any one of claims 1 to 4 and adapted to form an image.

15 6. A color image forming apparatus according to claim 5, further comprising a printer controller that converts color signals inputted from an external device into image data in different colors and inputs the image data to the optical scanning apparatus.

20 7. An optical scanning apparatus, comprising:
light source means for emitting a plurality of beams;

a plurality of incident optical systems for
25 temporarily focusing the plurality of beams emitted from the light source means in a sub-scanning section to form a linear image on a deflection surface of a

common light deflector; and

a plurality of scanning optical systems for
guiding the plurality of beams deflected by the
common light deflector onto a different surfaces to
5 be scanned, wherein:

the plurality of scanning optical systems have
scanning optical elements each having a refractive
power in the sub-scanning section;

the plurality of beams incident on the common
10 light deflector are incident at an angle with a
normal to the deflection surface in the sub-scanning
section; and

each of an optical axis of the scanning optical
elements of the plurality of scanning optical systems
15 are eccentric toward a deflection point side of the
deflection surface with respect to a transmission
position of a principle ray of each of the plurality
of beams in a sub scanning direction to meet the
following expression:

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$$(\beta_{\max} - \beta_{\min}) < P/\Delta L$$

where P represents a pixel size defined according to
a resolution in the sub-scanning section; β_{\max}
represents a maximum value of a magnification in the
25 sub-scanning section of an entire scanning region of
the plurality of scanning optical systems and β_{\min}
represents a minimum value of the magnification in

the sub-scanning section of the entire scanning region of the plurality of scanning optical systems; and ΔL represents a distance between the normal to the deflection surface at the deflection point and
5 the optical axis of the scanning optical element in the sub scanning direction.

8. An optical scanning apparatus according to claim 7, wherein the imaging magnification in the
10 sub-scanning section of the plurality of scanning optical systems is set to $\pm 10\%$ or less in the entire scanning region.

9. An optical scanning apparatus according to
15 claim 7, wherein the imaging magnification in the sub-scanning section of the plurality of scanning optical systems is 0.7-fold or higher magnification in the entire scanning region and the plurality of scanning optical systems each include a first
20 scanning optical element having a refractive power in a main-scanning section and a second scanning optical element having a refractive power in the sub-scanning section, which weakens from an on-axis position to an off-axis position.

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10. An optical scanning apparatus according to claim 9, wherein in the sub-scanning section, the

principle ray of the beam incident on the second scanning optical element enters the second scanning optical element at an angle with an optical axis thereof and the optical axis of the second scanning optical element extends in parallel to the normal to the deflection surface.

11. A color image forming apparatus comprising a plurality of image bearing members each arranged on a surface to be scanned of the optical scanning apparatus according to any one of claims 1 to 7 and adapted to form images in colors different from one another.

12. A color image forming apparatus according to claim 11, further comprising a printer controller that converts color signals inputted from an external device into image data in different colors and inputs the image data to each optical scanning apparatus.